

Advanced Ceramics Property & Performance Measurements

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Introduction

Mechanical and physical properties and performance of brittle bodies, including advanced ceramics and glasses, can be difficult to measure correctly unless the proper techniques are used. ASTM Committee C28 on Advanced Ceramics has developed numerous full-consensus standards (e.g., test methods, practices, guides, terminology) to measure various properties and performance of a monolithic and composite ceramics and coatings that, in some cases, may be applicable to glasses. These standards give the "what, how, how not, why, why not, etc." for determining many mechanical, physical, and thermal, properties and performance of advanced ceramics. Use of these standards result in accurate, reliable, repeatable and complete data. Involvement in ASTM Committee C28 has included users, producers, researchers, designers, academicians, etc. who write and continually update, as well as validate through round robin test programmes, more than 45 standards since the committee's inception in 1986. Included in this poster is a pictogram of the ASTM Committee C28 standards and how to obtain them either as i) individual copies with full details or ii) a complete collection in one volume. A listing of other ASTM committees that might be of interest is included. Finally, some examples of the tangible benefits of standards for advanced ceramics are employed to demonstrate their practical application.

For further information

The C28 Committee and Standards for Ceramics
ASTM C28 Committee Page =
<http://www.astm.org/COMMITTEE/C28.htm>

List of C28 Subcommittees and Links to Standards-
<http://www.astm.org/COMMITTEE/C28.htm>

ASTM C28 Advanced Ceramic Standards by Subject-
<http://www.astm.org/COMMITTEE/C28.htm>

Chart showing ASTM C28 Advanced Ceramic Standards-
<http://www.astm.org/COMMITTEE/C28.htm>

ASTM Standards for Advanced Ceramics, Whitewares, Glass, and Ceramic Tile-
<http://www.astm.org/Standards/glass-and-ceramic-standards.html>

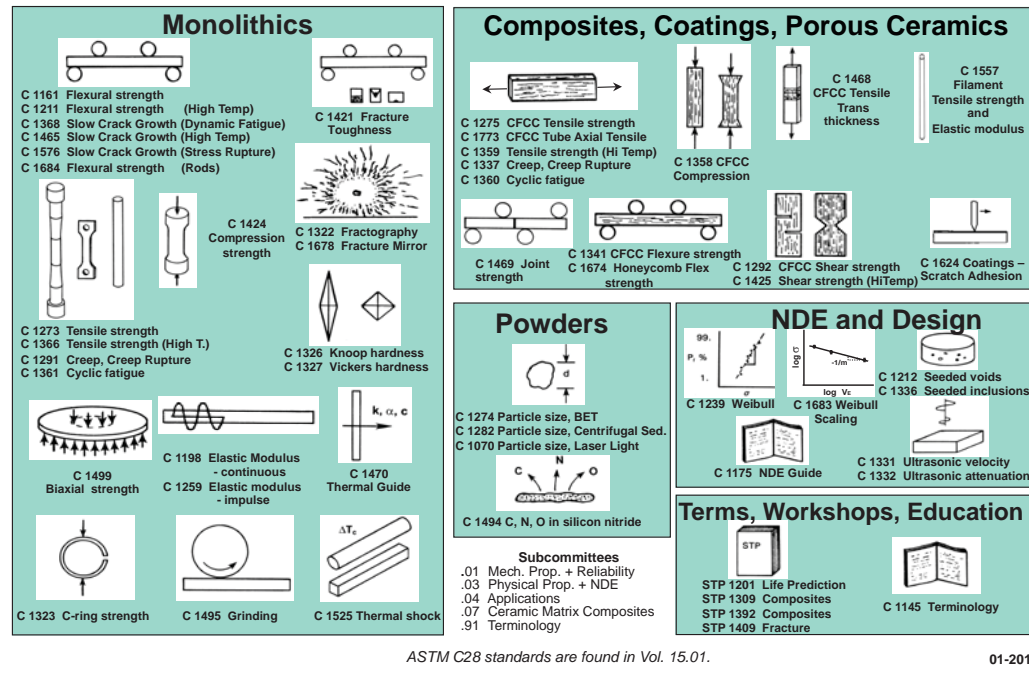
Acknowledgments

We thank the more than 90 industry, government, and academic committee members from many countries (~25% non-USA) who have volunteered many hours to develop these standards via work in six technical and four administrative subcommittees.



C28 Advanced Ceramic Standards

Visit the C28 website (<http://www.astm.org/COMMITTEE/C28.htm>) to purchase C28 standards or join the C28 committee.



Collaborating ASTM Committees: C08 Refractories; C21 Ceramic Whitewares and Related Products; C26 Nuclear Fuel Cycle; D30 Composite Materials; E07 Nondestructive Testing; E08 Fatigue and Fracture; E10 Nuclear Technology and Applications; E28 Mechanical Testing; F04 Medical and Surgical Materials and Devices; F34 Rolling Element Bearings; G02 Wear and Erosion

Collaborating International Organizations: ISO TC206 Fine/Technical/Adv Ceramics; CEN TC184 Technical Ceramics

Standardization: Tangible Benefits

F 1973: Standard Specification for High Purity Dense Yttria Tetragonal Zirconium Oxide Polycrystal (Y-TZP) for Surgical Implant Applications

ASTM Committee F04, Surgical and Medical Devices and the U.S. Food and Drug Administration used generic standards from Committee C28 Advanced Ceramics for their new standard specification.

"The average flexural strength shall be 800 MPa or greater by 4 point bending in accordance with ASTM C 1161"
"The minimum elastic modulus shall be 200 GPa in accordance with C 1198 or C 1259"
"If Weibull modulus is tested, it shall be tested in accordance with C 1239"



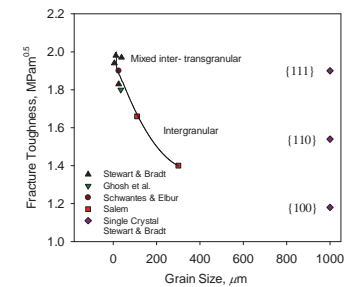
Standardization:

Tangible Benefits

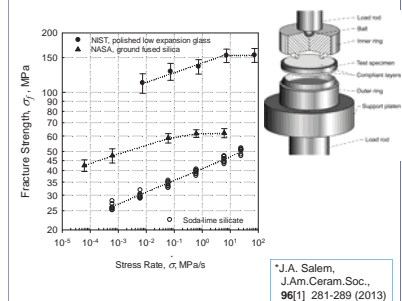
Comparisons Among Authors and Helping to Interpret Data

The Problem:
Transparent Armor Ceramics as Spacecraft Windows*

Standardized fracture toughness tests using Test Method C1421 ensure correct comparisons of different authors' results --



Standard-sized circular disks could be used to determine Poisson's ratio and Young's modulus via Test Method C1259 and biaxial strength via Test Method C1499 as well as the slow crack growth parameters, n and A, via Test Method C1368. This allowed efficient understanding of the behavior of the material.



*J.A. Salem, J. Am. Ceram. Soc., 96[1] 281-289 (2013)